Disability Visibility Podcast

Episode 29: Robotics

Guests: Kavita Krishnaswamy

Host: Alice Wong

Transcript by Cheryl Green

For more information: https://disabilityvisibilityproject.com/podcast/

Introduction

[radio static, voices singing with hip-hop beat]

LATEEF MCLEOD: This is the Disability Visibility Podcast with your host, Alice Wong.

ALICE WONG: Hey, my peoples! It's me, Alice Wong. And welcome to the Disability Visibility Podcast, conversations on disability politics, culture, and media.

Episode 28 featured a panel conversation with three disabled people working in STEM fields: STEM meaning science, technology, engineering, and mathematics. Today we're going to dig a bit deeper in my interview with Kavita Krishnaswamy, a Ph.D. candidate in Computer Science at the University of Maryland, Baltimore County. I don't think we hear enough stories about disabled scientists, and Kavita will share how she got into robotics and the access barriers she faces in STEM. As someone with spinal muscular atrophy, Kavita will talk about the potential of robots providing assistance and greater independence for people with disabilities. You're also gonna hear her mention various hardware and software she uses in her work such as Linux, Ubuntu, Dragon Dictate, and something called the Beam Telepresence Robot, a device that allows a person to participate virtually from a tablet or laptop. The future is here, y'all. Are you ready? Away we go!

[electronic beeping]

ELECTRONIC VOICE: 5, 4, 3, 2, 1!

ALICE: Hey, Kavita. Thank you so much for being on my podcast today. I'm so glad that I finally got a chance to talk to you.

KAVITA KRISHNASWAMY: Hi, Alice. Yeah, really appreciate you inviting me to be a part of your project, and I'll share my experiences and my story with all of you. I really appreciate it. Thank you.

ALICE: So, how about we start with maybe you can introduce yourself and say anything you'd like to share.

KAVITA: OK, sure. So, I'm a Ph.D. candidate at the University of Maryland, Baltimore County, UMBC. And I'm working with Dr. Time Oates at UMBC on assistive robotics to help people with disabilities and seniors get physical independence, and that's the goal of my dissertation: to make sure that I can help people get physical independence as much as possible. And the challenge is, even if there's a lot of robotic technologies out there, then the other challenge is accessibility. Because most of the robots that we have now, they're controlled by joystick and

maybe keyboard or very difficult Python programming. It's not easy and not intuitive and not friendly. So, my goal is to make sure that we create a accessible interface in order to control that robot.

Becoming interesting in technology and robotics

ALICE: So, why don't we go back in time a little bit, and I was wondering if you could tell me when you first got interested in robotics. Was it when you were a kid?

KAVITA: Right. Right. Well, growing up, I realized that technology helped me expand my physical limitations. Like, I understood even though writing became more and more difficult for me that using a computer really improved my effectiveness and productivity. So, that's when I realized you know, technology's kind of amplifying my difficulty, I mean my limitations, and making sure that I have equal access to all the other tasks or other ways of making sure I express my ideas. So, that's when I realized technology is the path. So, that inspired me to join the STEM student group in high school. It was called Mathematics Engineering Science Achievement Program, MESA. And in that, we had different projects that students would divide into groups and then work on this project. And nobody chose robotics. It was a big surprise to me, and that's when I thought you know, why don't we create history at high school? Because it would be the first robotics project our high school would be participating in.

So, I participated, but the challenge I had was to create the robot. I needed physical help to actually build it and assemble it. So, I had to have help, and I'm really blessed with two younger brothers. So, they were my hands. Under my instructions, both of them—both of my brothers—they assembled the robot according to my direction. And I was able to write the code for it. So, we applied for the IEEE Robotic competition in our state, and I was very happy to know we won 3rd place. And that was big history for our high school. Our high school is Wilde Lake High School. That's in Maryland too. And that really changed my perspective: if I really had the physical help to build and assemble a robot, I can make a change; I can make a positive impact. And I can leverage that technology to help people.

I had it in my head. So, during my undergraduate, I took Computer Science and Math as a dual major, but I never had the opportunity to do robotics. So, after my undergraduate, that's when I thought I should really find a way to get into robotics, and that's when I applied for my Ph.D. program to work on assistive robotics.

ALICE: It's pretty interesting how you and I have similar disabilities, and we're both used to having to tell other people how to do things so that we can get things done the way we want them to.

KAVITA: Right. You're right.

People doubting your abilities, and teaching others to help you meet your needs

ALICE: So, I'm kinda curious about this and wondered if you ever went through an experience of people wondering, oh, did you really do this work?

KAVITA: Uh-huh.

ALICE: Because sometimes when you can't do something physically, there's always that extra scrutiny of whether your work is really your own. So, I'm curious about whether during your high school years, whether anybody doubted whether you really did the coding and really did design your robot.

KAVITA: Right. I mean a lot of people thought I couldn't do robotics because I don't even have the strength to move my own hand. So, they gave me a look. People would give me a look that I realized the meaning behind that look was saying, "How," or "This is impossible. Why is she even trying?" But I never let that stop me because I feel like when people tell me I can't do something, I have to prove to them that I can, you know? That's really been my, I guess, my way of thinking when people say no to me. When people say no to me, I always think I have to try again, to stop me from trying to do it.

And I wanted to mention that I was part of the Maryland Youth Leadership Network. It was, I think, a week-long conference for young students with disabilities where we would leave our home for one week to spend like an entire week away from home, just to gain the experience that we can live without our primary caregivers, our parents. So, that really changed my perspective. It was the first time I was ever away from home, and I remember really being disappointed, crying. I mean I was 16 at the time, but I was still crying because I left home, right? Because I wasn't used to the support system, relying on caregivers for a whole week, 24/7. It was not just for a couple hours in a day; it was the entire week that I had to rely on people that I've never met and people that has no training in helping me and doesn't understand the complications of spinal muscular atrophy at all. So, within that one week, I had to learn to train them. I had to learn to train them, and I had to make sure they understood my needs of physical care. So, all of that was really challenging at that point. But right now, when I look back, I think all of that trained me in order to become a stronger person today because I know how to ask for help. I know how I can get help and get my needs met, right, just so I can complete the activities of daily living. It's so basic, but it's so challenging because of all the tasks that are involved.

ALICE: And I do think that since we're both born disabled and had to rely on people at an early age, it really set us up with a lot of skills and a lot of insight on how to communicate with people, how to really learn about personalities and ways to be effective in terms of getting your needs met, especially when you rely on others. And we really learn how to make the most out of what we have.

KAVITA: Uh-huh. Right. And we need customized care, really, right? Everybody takes care of their body in their own unique way, right? But to get that across to new people that we meet, it's often very challenging.

Adaptations and accommodations

ALICE: So, I'm curious about what kind of accommodations you've used throughout your high school, undergraduate, and graduate education. Can you give me some examples of various adaptations?

KAVITA: You know, with spinal muscular atrophy we get progressively weaker. So, at that point, I was able to write by hand. So, all I had to use was a graphite pencil, you know, the old pencils? So, it would only require a little pressure that I had to apply in writing, and that would make my writing easier so I don't have to press hard on the paper. And I was able to turn pages in a book by myself. I was able to use a standard mouse. I could use the keyboard a little bit, but I often would get tired. And I would rely on the onscreen Macintosh keyboard in high school, and I think they still have it. It's called Co:Writer. It's the word prediction. I'm pretty sure they still have it. I remember using that. That was always helpful. And the challenge with that was you had to get the keyboard separate, and you had to get the word prediction separate; it wasn't a complete package. So, I remember that.

Then gradually, my arms became weaker. From writing by hand, I switched completely to typing on the keyboard. So, instead of writing by hand, I completely switched to typing on the computer.

ALICE: And with mathematics, was that ever an issue?

KAVITA: Right, oh. That was a big challenge because mathematical equations, right, they require a lot of those mathematical notations [chuckles] especially differential equations, calculus, trigonometry. It was very challenging for me.

ALICE: Were there any particular programs or apps that helped you?

KAVITA: Yes. Thankfully, my math advisor, Dr. Muddappa Gowda, he was very helpful for me. He wanted to see my succeed and not quit my Math major just because of these difficulties. So, on his own initiative, he found the program called MathType, and that would enable me to type code or type mathematical notations on the computer easily. So, that was very helpful for me. [bouncy music]

KAVITA: Programming was very difficult. On the Computer Science, you have to do programming, right? So, that was very challenging for me. So, I just typed the code that I had in a basic application like Notepad, and I would copy the code into the Linux system that we had on campus. So, it was like a two-process step for me in order to just compile the code and make sure it worked. Because all the accessibility software I have, it's on Windows; it's not on Linux, right? And in order to submit homework and projects at our college, we had to use the Linux system. And the Linux system is not based on a graphical user interface. Most of it is based on Command Line-driven. So, that was very difficult for me. So, often what I would do is I would type the commands in advance on a Notepad, then cut and paste each one to make sure it worked.

ALICE: So, it seems like you spent a lot more time and labor doing your homework and getting your studies done compared to other, non-disabled students. Is that correct?

KAVITA: Yes. I had to spend almost triple the time or sometimes five more times more work and time. And then, the challenge is, if my code didn't work, in order to fix it, I'd have to again copy it from the Linux system, go back to Windows, make corrections through the accessibility software I have, then paste it again. Well, it was very challenging.

ALICE: So, I was wondering if we could talk a little bit about your usage of the Beam Telepresence Robot in your current work.

KAVITA: Before that, I wanted to mention also in order to use Dragon NaturallySpeaking, the dictionary that's on Dragon is not really meant for programming, right? So, that was always a challenge too. I could write essays using Dragon, but I can never write code using Dragon. So, that was another challenge. So, I mean a lot of challenges, but I just took creative approaches each time. So, it's tough, [chuckles] and I'm still doing the same technique even now, almost 17 years from undergraduate till now. There still isn't a solution to program my voice.

Simon is a speech recognition software on Ubuntu. It's similar to Dragon. It's supposed to work as effective as Dragon, but it hasn't for me. And I've tried it on two machines, but I've never had the luck to make it work.

Beam Telepresence Robot

ALICE: And can you share a little bit with me about how the Beam Telepresence Robot has had a impact on your current work?

KAVITA: The Beam has really helped me to go to different destinations remotely, and it's really given me the ability to really share my ideas, get to work with people in real time. And it's really helped me to gain more research collaborations, and that's really helped me because I can move around. I have the mobility and autonomy to move and look at things, especially when we're doing the robotic experiments where I have to observe if the robotic arm is moving or not. That's been really helpful. I'm really thankful to Suitable Technologies for helping me provide the accessibility to use the Beam. Because without it, I don't think my research could have developed this far. So, I'm really thankful to them, especially Christa Cliver and Erin Rapacki. They were really helpful for me to get access to Beam.

ALICE: Right. So, did you reach out to them, or did they reach out to you?

KAVITA: Oh, I first met them, or I first met Christa Cliver in the Unicom conference in Seattle, Washington. It was a telepresence initiative study, and I had the opportunity to talk to her. And then I requested her that if I had the opportunity to use a Beam, it would really make a huge impact on my education and research. So, talking with her and Erin really helped me to get that accessibility. OK, so, it's like I have wings. I can go to any conference, as long as there's a Beam there.

[bluesy music]

ALICE: So, it's great that the Beam allows you to participate at various events and conferences. I'm curious about whether travel is a barrier for you. I think a lot of folks don't realize how much preparation and additional work is involved for some people with disabilities who need to get extra rooms, need to get extra people to help stuff, have to pack extra stuff. So, is that something that's a barrier you've faced, since clearly, graduate work and you have to do presentations. You have to usually go out and interview and network. So, what has that been like for you?

KAVITA: When those challenges arise, I try to seek out help either through Skype, Google Hangout, or the Beam if a Beam is there on the location. So, that's always been my way of traveling remotely. One day, if God gives me a chance, I could really travel in person. I'm still hopeful because you know, they have Spinraza, right? [chuckles] Maybe that'll help us.

ALICE: Yeah, that's certainly something.

The future of robotics and its challenges

ALICE: So, what is your vision for the future of robotics and they can help people with disabilities and older adults with their activities of daily living?

KAVITA: My vision is that a person with a severe physical disability can independently achieve their tasks in activities of daily living with the support of a robotic system that they can accessibly control. It should either have artificial intelligence in order to learn about each individual user and accommodate according to their needs. That's my long-term goal. And I'm just trying to make the first few steps forward in order to initiate that.

ALICE: That's a really huge goal. And what are some of the immediate challenges that have to be sorted out in robotics first? What do you think are the most pressing issues right now?

KAVITA: Safety. That is the biggest challenge. We don't wanna inadvertently have the robot hurt the person. So, safety is a big concern. And I'm trying to create unique algorithms that can increase safety for the user. Like, an idea I had was if we can infer if somebody is in a unsafe situation, then the robot can understand that and change its action. Like, if somebody is rapidly blinking, that could indicate that the person is very anxious, and maybe he or she is in an unsafe situation. So, understanding that, a robot may be able to change its action, maybe by grasping the arm lighter or trying to put the arm on a pillow versus a table and see if there's any other change. So, there's a lot of learning that has to be performed too.

ALICE: Yeah, it seems like machine learning is still at a early stage. So, I was wondering what you think about current developments in AI.

KAVITA: I guess AI has not really focused on physical safety of the human-robot interaction. That area is still very young. So, my goal in my dissertation is to focus on that area and incorporate that knowledge into the interface that we develop. So, it's accessibility and machine learning that's involved that's going to be in the interface.

[ethereal ambient music]

Advice to others who have been discouraged from pursuing STEM and the promise in technology

ALICE: So, what's your advice to younger people, whether they're students or adults, who are just interested in STEM and robotics and may have been discouraged by other people about pursuing a career in STEM or have experienced physical barriers and other forms of discrimination and stereotyping?

KAVITA: Please don't be discouraged by difficulties. Regardless of any life that we look at, people will have difficulties. Maybe people with disabilities have more difficulties, but that should not stop you, and you shouldn't freeze, right? So, if you have a Plan A, and if Plan A doesn't work, go to Plan B. And just because you run out of two plans that didn't work out doesn't mean you should quit. Go to Plan C. But keep finding newer and newer plans, and something will work out. So, don't be discouraged by this, and don't let time be a factor either. And I really feel beyond, I guess, the emotional strength to keep finding, that's the most important.

ALICE: And where does your emotional strength come from?

KAVITA: I would say my mom. She has been very supportive. She has always told me that I have the same abilities just as anybody else, and that's really helped me to grow into the person I am today. Even if I am depressed, she would always encourage me to keep trying and find new ways.

ALICE: Do you have any final thoughts you'd like to share about robotics and the promise of technology for people with disabilities in the future?

KAVITA: There's a lot of promise in technology, and it would really allow you to be independent, more independent. And technology is the future, so when we learn technology, we can make an impact, right? We're part of the process; we're part of the technology that will exist in the near future. So, it's very important for individuals with disabilities to especially contribute their ideas towards the development of technology because the challenge is we don't want technology to, right, if technology exists, it should be accessible to everybody. The car has been in existence, but a person with a disability can't drive it, right? Only now, we have self-driving, autonomous

cars, right? And the cost of these high-tech technologies, they are so high we can't afford it. And you know, just to get our basic needs met, we need to have Medicare and Medicaid, right? And for us to have that type of insurance, the requirement is low income. So, if we already are on low income, how can we afford those high-priced technologies that increase accessibility, right? So, that's a huge challenge. Not only is it important to create technology, it's very important for us to create it affordability; it's a key factor. And accessibility is a key factor.

ALICE: Robots for everyone!

KAVITA: Ooooh! Yes. We need robots for everyone.

[hip hop]

ALICE: Thank you, Kavita, so much for being on my podcast today. I learned a lot. This was great.

KAVITA: Thanks so much, Alice. I really enjoyed this opportunity to speak with you.

Wrap-up

ALICE: This podcast is a production of the Disability Visibility Project, an online community dedicated to creating, sharing, and amplifying disability media and culture. All episodes including text transcripts are available at DisabilityVisibilityProject.com/Podcast.

You can also find links about Kavita's research on our website.

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Thanks for listening and see ya on the Internets! Byeee!!

♪ knees up, toes down, let's dance
get as low as you would if you were in sweat pants
how far will they go
oh yeah yeah
how far will they go
oh yeah yeah ♪